

BEES OF THE SUBFAMILY ANTHIDIINÆ, INCLUDING SOME NEW SPECIES AND VARIETIES, AND SOME NEW LOCALITY RECORDS

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The present paper is based in large part on specimens, admirably mounted for purposes of study and accompanied by floral records, that were generously placed at my disposal by Professor P. H. Timberlake of the Graduate School of Tropical Agriculture and Citrus Experiment Station, University of California. To Professor Timberlake I am indebted, too, for many valuable suggestions embodied in this paper. His collection was supplemented by contributions of material from Professor J. C. Bradley of Cornell University, Professor H. A. Scullen of the Oregon State Agricultural College, Professor O. A. Stevens of North Dakota Agricultural College, and Mr. Frank M. Jones. Specimens from the Pacific Coast largely predominate in the material loaned, but certain of the inland states—such as Arizona and Idaho—are also represented, and the discussion in the following pages leads occasionally to species even more remote geographically. The drawings accompanying this paper were made by Mrs. E. L. Beutenmüller, well known for her graphic renderings of insects, batrachians, and reptiles.

Anthidium cognatum Cresson, a Synonym of *A. maculifrons* Smith

New Records from Arizona and Mexico

On a recent visit to the British Museum (Natural History Division) I had an opportunity, thanks to the courtesy of Dr. J. Waterston, of examining the type of *Anthidium maculifrons* Smith. To the description of Smith is appended the locality designation: United States.¹ In 1878 Cresson described a bee

¹ Dalla Torre's expansion of this statement into "Western United States" (Cat. Hym., X, p. 464) is doubtless due to Cresson's record of putative specimens of *maculifrons* from Texas and Utah. All other *Anthidium* from

from Georgia as *Anthidium cognatum*, adding by way of summary:

“Allied to *maculifrons* Smith, but the shape of the apical segment of the abdomen is very different, that of *maculifrons* and *mormonus*, described below, being almost exactly alike.”

The allusion to *mormonus* proves almost to a certainty that Cresson confused *maculifrons* with some other species, for the male of *maculifrons* has a pygidium very different from that of Cresson's *mormonus*, the type of which I have also examined. In 1864 Cresson interpreted as *maculifrons* two females from Texas and one from Utah. The supplementary description that Cresson gives of these insects suggests that they were not *maculifrons* but *porterae* Cockerell, which has been reported from both of these states. This circumstance makes it all the more doubtful whether Cresson had the male of the true *maculifrons* before him when he drew comparisons between it and his own *cognatum*.

In my opinion *cognatum* Cresson is no other than *maculifrons* Smith.

In 1900 Cockerell reported that specimens of *Anthidium cognatum* had been collected by Townsend in the Organ Mountains of New Mexico and also in Fillmore Canyon of that state. I have before me a single male specimen collected by Professor Bradley in the Pajarito Mountains, Nogales, Arizona, on August 31, 1927, that on the basis of its structure is clearly allied to *cognatum*. Yet it differs from the specimens from the southeastern United States in having abdominal maculations almost identical with those that characterize *porterae*, the emarginations above on each of the lateral halves of the bands on segments 2-5 being abrupt, narrow, and deep. Atlantic seaboard specimens in the American Museum, on the other hand, have broad emarginations on the bands of these segments, suggesting a four-spotted condition in which each pair of spots is connected by a fine line. This, too, is the condition described in Cresson's allotype of *cognatum* from Georgia, and it is the condition, likewise, in Smith's type

the United States described by Smith in the Catalog of Hymen. Insects, 1854, were from Georgia and the chances favor, therefore, that the locality of *maculifrons* was also in the Eastern United States, probably Georgia.

of *maculifrons*. In further differentiation the Arizona specimen has a medianly interrupted band on the hind tibiae instead of a basal spot, and slightly broader and more triangular lateral lobes on the pygidium.

This Arizona specimen resembles individuals of a large series of bees from Mexico that in the British Museum (Natural History Division) have been assigned to *maculifrons*. By far the larger number of these are from Chilpancingo, Guerrero, 4600 feet, collected by H. H. Smith (Godman-Salvin Collection, 1911-1924) in October, but specimens taken by the same collector are represented in the British Museum from the following localities as well: Acaguizotla, Guerrero, October, 3500 feet; Venta de Zopilote, Guerrero, October, 2800 feet; Tepetlapa, June, 3000 feet. My note made in the British Museum regarding these specimens reads as follows:

“The males from Guerrero are four-spotted on segment 1 and many of them also on segment 2. To a few of them the description of *cognatum* given in my key (Amer. Museum Novitates No. 253, p. 10, March 1, 1927) would apply: ‘The inner maculations on abdominal segments 3-5 connected with the outer maculations by thin bands of yellow.’ But others have lateral interruptions on bands 3-5 of the abdomen that more nearly resemble the V-shaped interruptions of *porterae*. To the associated females from Guerrero the characters given in my key would not apply. Only segment 1 is as a rule four-spotted in these females while the lines connecting the inner with the outer maculations, instead of being long, are distinctly narrow links. In some of the specimens there is on the apical tergites merely a sinuous emargination of the bands above, much as in those of the female of *mormonum* (= *blanditum*) and its allies. In fact, if it were not for the distinctive structure of the male, one would hardly recognize these insects as a variety of *maculifrons* (= *cognatum*).”

Are they, however, even a valid variety of that species? If the peculiarities in the maculations were constant, one would feel greater confidence in delimiting a western form of *maculifrons* distinct from that of the eastern seaboard of the United States. But even in Mexico specimens inseparable from the eastern form may be found. There is such a specimen (a male)

in the U. S. National Museum from the Federal District of Mexico, collected by L. Conradt; and in the entomological laboratory of the Natural History Museum in Paris I came upon a similar specimen taken by L. Digueet in 1903 in the State of Jalisco.

Anthidium maculosum Cresson and its Synonym *A. americanum*
Friese (= *maculatum* Smith nec Panzer)

Among Anthidiine bees sent me by Professor Bradley is a specimen of this species from Atzacapozalco, Mexico. Some time ago (Amer. Mus. Novitates, Number 253, p. 3, March 1, 1927) I raised question whether *maculosum* is not the same insect that Smith designated as *maculatum* and Friese renamed *americanum*. The definite evidence that *maculosum* occurs in Mexico, from which *maculatum* was described, lent additional support to this interpretation, and finally all doubts were dispelled through an examination of the type of *maculatum* Smith in the British Museum.

Anthidium edwardsii Cresson
New Record from Idaho

This species, hitherto known from California, Oregon, and Washington (reported as *hesperium*, *tricuspidum*, and *depressum*), extends into Idaho as is evidenced by a female from Star, collected on August 4 by D. A. Wilbur and sent me for determination by the Oregon State Agricultural College.

Variability of *Anthidium aridum* Cockerell

A large series of insects, comprising no less than twenty-four females and twenty-four males, have been loaned by Professor Timberlake. They are all from one locality—Big Pines Camp, Los Angeles County Park,¹ California, and were taken by him July 11–17, on *Phacelia heterophylla* and *Phacelia ramosissima*,

¹ "This locality," writes Professor Timberlake, "is on the desert side of the San Gabriel Mountains, and overlooks the Rock Creek region. The elevation of the camp is about 6,800 feet, but collecting was done a few hundred feet both above and below this level."

two of them in copulation. While all are apparently one species, they present an almost bewildering diversity in their maculations and even structurally, not to mention differences in the color of the ventral scopa. They are believed to be *A. aridum* Cockerell, hitherto known only from the male.

All of the male specimens have a yellow stripe on the scape (though sometimes faint), the axillæ unmaculated, the abdominal bands beyond that on segment 1 uninterrupted or merely subinterrupted medianly—distinguishing features set down in Cockerell's original description. The maculations on the tegulæ and tubercles, as well as the broadly interrupted stripe on the scutellum, are also present in all of these males. But the mesonotum is sometimes immaculate, sometimes with stripes merely on each side of its anterior margin, and sometimes with these stripes and in addition stripes above the tegulæ. In some of the male specimens there are maculations on the femora (in no case, however, extending beyond the apical half); in others the femora are immaculate. The maculations on the tibiæ, too, are far from being standardized. Sometimes they cover very nearly the entire outer surface of the joint; in other instances they are stripe-like, and in one specimen at least the stripe is interrupted on the front and middle tibiæ, while on the hind tibiæ it shrinks to a basal and faint apical spot. The pygidium is sometimes maculated, sometimes not, and its structure too is variable, the divergence of the lateral lobes basally and their convergence apically being much less emphatic in some specimens than in others. Nevertheless, there is usually traceable, if the central spine be eliminated from consideration, a simulation of a half moon (though not so markedly so as in *A. palliventre* = *A. californicum*), while in all of the specimens the apical half of the lateral lobes is more or less decidedly angulated.

Even more variable than the males are the females. While the males have the ventral hairs grayish white in conformity with those of other parts, the females more often have a predominance of black hair in the ventral scopa. Sometimes this takes the form of a large apical to central area of black hairs sharply bordered at the side by white hairs and more broadly and less defi-

nately at the base by white hairs with black tips. But there are degrees of intergrade from this condition to a ventral scopa completely white except at the very tip of the venter.

In contrast to the males all of the female specimens have the axillæ maculated and most of them have the scape immaculate. The mesonotum of the female presents in its ornamentation all phases of variability from well-formed bisymmetrical L-shaped stripes extending along the anterior and lateral borders to a completely immaculate condition. The maculations of the legs are on the average rather fuller than in the male. Almost invariably the front and middle femora have a stripe, confined to the apical half. The tibiæ are completely maculated or broadly striped externally, but the stripe on the front and middle tibiæ has a tendency to terminate abruptly before the apex is reached. The hind basitarsi are yellow, the front and middle pairs concealed by pubescence.

It is in the maculations of the head, however, that the greatest variability appears. Typically the females have the mandibles mostly yellow, the clypeus yellow except for the apical rim and a more or less extensive area of black at the base, and well-developed cuneiform lateral face marks filling the space between the clypeus and the inner orbit of the eye. But while the maculation of the mandibles is fairly constant, the amount of yellow on the face shows many degrees of intergrade from the condition above described to one characterized by the absence of lateral face marks and the reduction of the yellow on the clypeus to a spot on each side. The resulting combination of maculated mandibles with the absence of maculations on the sides of the face thus ceases to be the exclusive prerogative of the females of *A. palmarum*.

The band of segment 1 of the abdomen is in the females of *aridum* very slightly interrupted, the resulting halves usually taking the form of two mesad-pointed acute triangles instead of the four-spotted condition typical of segment 1 in the male. The bands on segments 2-5 are continuous, being merely notched at the middle and more or less sinuously emarginate above on the sides. Segment 6 is usually wholly yellow except for a small rounded black spot in a depression at each side near the base,

but in two of the females the yellow area is bisected by a thin line of black. The females of *A. mormonum* and some of its allies likewise have segment 6 prevailing yellow, but, instead of the black rounded spots above referred to, these females have inward- and downward-slanting black lines that invade the yellow at the base of segment 6. To be emphasized, too, is the much more curvilinear contour of this segment in *mormonum* and the insects closely affiliated with it.

Exceedingly close to these females believed to be *aridum* are the females from Flagstaff, Arizona, which were taken at flowers of *Iris* by F. C. Pratt and which Professor Cockerell believed to be *Anthidium pondreum* Titus (Proc. U. S. Nat. Mus., XL, pp. 248-249, 1911). Professor Cockerell assigned these specimens to *pondreum* because he associated with them four males from the same locality that he believed to be *pondreum*. Through the courtesy of the United States National Museum one of the males and one of the females from Flagstaff identified by Professor Cockerell were recently sent me. They are, in my estimation, insects of two different species. The male is, I believe, *pecosense*, which Professor Cockerell reported from the same region. It can be differentiated structurally from the females believed by him to be *pondreum* perhaps most readily by the sculpturing of the propodeum. In *pecosense*, male as well as female, the basal part of the triangular enclosure is covered by a band-like stretch (interrupted in the middle) of rather large punctures laid on a tessellated surface. The entire apical part of the enclosure beyond these basal bands and even the break between the bands at the middle of the base are covered by a dense fine tessellation that in places seems grouped into microscopical ridges running now subparallel to one another, now convergingly or even confluent. In contrast, what Professor Cockerell designates the female of *pondreum* has the basal part of the triangular enclosure of the propodeum covered by punctures that are laid on a surface virtually devoid of tessellation and these punctures extend broadly far down toward the apex. However, the apical region itself of the enclosure is entirely devoid of both punctures and tessellation, presenting a polished appearance that at once serves to differentiate it from the corre-

sponding surface in the male from Flagstaff. This condition applies not only to the female of *pondreum* as interpreted by Cockerell but also to the males and females from Big Pines Camp that I have assigned to *aridum*.

The affiliation of the females from Flagstaff believed by Professor Cockerell to be *pondreum* with the females from Big Pines Camp is much closer than might at first seem to be the case. Professor Cockerell's conclusions were based on two females only, but through the kindness of the United States National Museum I have had the privilege of examining six additional females from Flagstaff that were taken at the same flower (*Iris*), by the same collector (Pratt) and in the same month and year (June 9-12, 1909) as the specimens studied by Professor Cockerell. The maculations of these six reveal the variability that so often becomes manifest within a single species of the Anthidiinae when even moderately large series of these insects are available, and recall the caution of Friese (*Die Bienen Europa's*, 1898, p. 89): "Hier mag auch noch erwähnt werden, dass auf die gelben Zeichnungen des Körpers wenig Gewicht zu legen ist, da ausserordentliche Veränderlichkeit in der Ausdehnung derselben sich bei einer Art zeigt."

These six additional specimens indicate that the yellow of the thorax is not in all cases "confined to a stripe above each tegula" and the femora are not in all cases "black without the large yellow stripes." In fact, only in one of the six specimens mentioned is there no maculation on the front margin of the mesonotum, while in another specimen there are even L-shaped bands rimming the mesonotum. All of the specimens have maculations on the femora (confined as in the putative females of *aridum* to the apical half).

Points of differentiation between the females here assigned to *aridum* and Professor Cockerell's putative female of *pondreum* are rather tenuous and to some extent overlapped by the variability indicated within each group. In all of the specimens from Flagstaff, however—and this applies not only to those taken by Pratt but also to two specimens from the same locality taken respectively by Ashmead, July 21, 1897, and by Barber and

Schwarz—there are rather large emarginations laterally at the base of the otherwise yellow tergite 6 in contrast to the imbedded spots in the otherwise yellow tergite 6 of the females believed to be *aridum*. The Flagstaff insects all have light scopa, with sometimes a touch of black at the apex, in contrast to the usually more extensive black scopa of the insects from Big Pines Camp. In all the specimens from Flagstaff the band on tergite 1 has lateral emarginations, usually posteriorly, in contrast to the usually unemarginate condition of this band in the specimens from Big Pines Camp. Also, more often than not a triangle of black occupies the central region of the clypeus in these Arizona specimens (though in two of them shrunken to a black W at the base of the clypeus) whereas in the California specimens the yellow of the clypeus is usually more pervasive. In the much more essential matter of structure, and especially in the structure of the last tergite, the insects from the two localities seem to be alike.

Anthidium mormonum fragariellum (Cockerell)

Professor Timberlake has supplied the following floral records for the females represented in his collection: Yosemite Valley, June 27, 1926, two specimens on *Lotus nevadensis*; Big Pines Camp, Cal., July 11–13, 1927, two specimens on *Phacelia ramosissima*, one on *Phacelia heterophylla*, one on *Lotus davidsoni*; Coffee Camp, Cal., June 8, 1925, one on *Lotus scoparius*; San Jacinto Mts., July 14, 1912.

A large series of males from the same localities have floral records corresponding to those of the females.

Anthidium placitum Cresson

The following locality and floral records are of interest in connection with a series of females taken by Professor Timberlake: Big Pines Camp, Cal., July 11–17, 1927, on *Cordylanthus nevini*; Mt. San Antonio, Aug. 23, 1920, on *Cordylanthus filifolius*, at an elevation of 4,800 feet, and Aug. 23, 1920, also on Mt. San Antonio, with the notation “on wet soil by creek.”

Two of the males (= *A. bernardinum*) collected by Professor Timberlake on Mt. San Antonio duplicate the data for the females

from that locality. Other males were taken at: Big Pines Camp, Cal., July 12-17, 1927, on *Phacelia heterophylla*; San Jacinto Mts. (col. A. J. Basinger), Sept. 2, 1923.

Anthidium permaculatum Cockerell

In 1924 Professor Cockerell described this species (Proc. Cal. Acad. Sci., 4th Series, Vol. XIV, p. 349) on the basis of two specimens from Oregon. Later I described (Amer. Mus. Novitates, Number 252, Feb. 28, 1927) certain specimens from Wyoming, Utah, and Idaho as *niveumtarsum*, stating at the time: "These specimens have been designated as a new species, but it is very possible that they are not entitled to such rank, having perhaps merely varietal importance. They are apparently very closely allied to *permaculatum*." I then went on to note certain characters that seemed to differentiate *niveumtarsum* from *permaculatum*.

Since then I have obtained through the kindness of Professor H. A. Scullen a large series of bees (fourteen females and three males) from localities in Oregon. These are assignable to *permaculatum* but show sufficient variability to bridge practically all of the distinctions that I was inclined to believe separated *niveumtarsum* from *permaculatum*. In none of the specimens, however, are the inner spots on segment 1 of the abdomen larger than the outer marks (as noted by Professor Cockerell) and in many of them the four-spotted condition of segment 1 is replaced by a medianly interrupted band with posterior emarginations laterally.

In a few of the specimens there are L-shaped bands rimming the mesonotum, in others these bands are broken, but in a majority of instances there is merely a stripe above the tegulae. In like manner the stripes on the femora may be present or absent, the hind basitarsi may be maculated or not, and the clypeus may present the condition of being wholly maculated except for a median longitudinal ribbon of black or of being mostly black with merely a small spot at each side. The apical rims of the abdominal segments are closely punctated in all of the specimens. Cockerell has noted that the clypeus of the

female is bidentate on each side. In the male the clypeus has a strong median curvilinear emargination. In only one of the three male specimens is the pygidium maculated.

With the exception of one specimen, a male, secured by W. J. Chamberlin at Sparta, Baker Co., on July 2, 1922, all of the specimens from Oregon before me were collected by Professor Scullen. Two specimens, bearing date of July 16, 1927, were caught at Burns, at an elevation of 4,150 feet; twelve were taken July 17, 1927, at Glass Buttes, fifty-seven miles west of Burns; another specimen was obtained the same day as the above, fifty-three miles east of Bend; a single specimen from Wildhorse Canyon, Steens Mts., was collected at an elevation between 4,270 and 6,000 feet on July 5, 1927.

Anthidium tenuifloræ Cockerell

Two males and a female of this species were collected by Professor Timberlake, July 11, 1927, on *Lotus davidsoni*. A third male was caught, July 13, 1927, on *Epilobium californicum*. The specimens are from Big Pines Camp, California.

Form close to *Anthidium tenuifloræ* subsp. *yukonense* Ckll.

From Mount Hood, Oregon

Four specimens—two males and two females—taken by Professor Scullen, August 19–21, 1927, on Coopers Spur, Mount Hood, Oregon, at an elevation of 6,000 feet, occupy a position somewhat intermediate between Cockerell's subspecies and true *tenuifloræ*. The males share with Cockerell's type the unusual condition represented by the immaculate first tergite. The second tergite is, however, in these specimens four-spotted, not "with only small lateral spots," and the sixth tergite has two small comma-like maculations. The accompanying females have the first tergite more fully maculated than is indicated by Cockerell and have vestiges of maculation on the sixth tergite.

These specimens seem to represent a transition from *tenuifloræ* proper to the form recognized by Cockerell as *yukonense*. The markings noted by Cockerell for *yukonense* other than those on the abdomen, as well as the white hair of the thorax, are

shared by several specimens from Colorado which I have interpreted to be true *tenuifloræ*.

***Anthidium clypeodentatum* var. *lutzi*, new variety**

A female *Anthidium* from California that is the property of the Los Angeles Museum is structurally so similar to the females of *A. clypeodentatum* Swenk that it seems the part of conservatism to assign it to the same species to which Swenk's insect belongs, although, were it not for the variability that I have noted in the structure of the clypeus of *clypeodentatum*, I should feel tempted to make the California specimen a distinct species. The apical margin of the clypeus in this specimen is distinctly denticulate only along the sides, the median part of the margin being merely faintly irregular due to microscopic ridges. In other structural respects the insect accords with what I have interpreted to be *clypeodentatum*. At the least this specimen is entitled to varietal recognition, for, in contrast to the subdued ornamentation of *clypeodentatum* proper, it is rather conspicuously arrayed. The maculations are deep yellow and are distributed as follows:

Mandibles except apex and extreme base, entire clypeus except for an irregular intrusion of black at the middle of the base and the middle of the apex, lateral face marks completely filling the space between the clypeus and the eye and truncated at the level of the base of the antennæ, a minute spot at the apex of the scape, a heavy, backward-directed subrectangular spot above the summit of each eye and a minute spot above each of the lateral ocelli. The mesonotum bordered by heavy L-shaped bands that are nearly confluent with the maculations on the axillæ and scutellum, the latter with a neatly defined separating area of black posteriorly. The tubercles yellow and the tegulæ with a large yellow maculation anteriorly and a smaller one posteriorly. A small spot on the mesopleura. The hind coxæ with a touch of yellow; all of the femora striped beneath; knee spots on the middle and hind legs; all of the tibiæ and basitarsi externally yellow (on the tibiæ there is a reddish hyaline spot near the apex). All of the tergites banded: the band on seg-

ment 1 medianly interrupted but without lateral emarginations; the bands on the subsequent segments merely subinterrupted or emarginate medianly but with emarginations on each side above that slant slightly laterad, though much less markedly so than in specimens of *clypeodentatum* proper that have come to my attention. Tergite 6 with two incompletely enclosed black spots in a broad field of yellow, and with the serrations on the truncate sides of the apex and the central bifid process brownish black.

The female was collected presumably by Doctor Davidson and bears on its label a "W." Professor Timberlake, to whose forethought I am indebted for the opportunity of examining this specimen, interprets the "W" as standing for Mt. Wilson. With this specimen are associated: three males, two of which are marked with a "W" like the female; a third that lacks a label but is presumably from the same locality as the previous two; and a fourth from Dulzura, California, that is discussed under the heading of *psoralea* in the Canadian Entomologist, Vol. 60, pp. 214-215, 1928. This male, which was taken June 20, 1917, by Mr. W. S. Wright, has been made the allotype of the new variety. The description follows:

Male.—Length 11 to 12 mm. Black with yellow markings. Head about the width of the mesonotum, and approximately three-quarters as long as it is wide. The eyes, pale green, converging below. The mandibles with the apical tooth elongate, slightly falciform, and with the median tooth and inner tooth much less strongly developed. The clypeus convex with a glistening median longitudinal carina; the apex of the clypeus only very slightly emarginate along its middle, almost straight. The punctation on the head and thorax dense except for a narrow polished rimlike area half encircling each of the ocelli and impunctate shiny spots on each side of the mesonotum at the level of the tegulæ. The propodeum shiny, with fairly large, for the most part sparse punctures along its base that become more closely grouped at the sides, the entire apical region of the triangular enclosure being devoid of punctures and rather polished. The basal tergite with coarse, somewhat indistinct, fairly dense punctation. The remaining tergites with relatively finer punctures that are, however, irregular both in size and distribution. Viewed from certain angles some of these punctures seem elongate and blotchy due doubtless to the faintly striate character of the surface on which they are laid, particularly along the sides of the tergites. The rims of the segments are more densely punctured than the basal portions. Tergite 6 armed on each side with a straight to slightly curved (as distinguished

from a hook-like) spine. The median spine of the pygidium long and slender, terminating nearly on a level with the relatively broad lateral lobes. Each of these lobes has near its inner extremity a sharp emargination, with the result that there is a small mesad-pointed extension on the inner tip of each lobe. This is the most characteristic structure in the male. The last segment of the venter has a backward-pointing, rather elongate ferruginous process medianly and on each side a downward-directed angle that is due to the sharp bend of the contour.

The genitalia of this insect are rather like those figured by Miss Ruth Isensee² for *Anthidium pondreum*, though the identity is not quite so complete as in the case of *cockerelli* described elsewhere in this paper. The volsellæ especially seem slightly different, broader than in Miss Isensee's drawing for *pondreum*, but the sagittæ and stipes are virtually the same.

Grayish to white hair on face, pleura, legs (except inner surface of basitarsi) and abdomen beneath; the scape with a conspicuous brush of light hair. The vertex, thorax above, and dorsum of abdomen with ochraceous hair (these parts gray in one of the specimens).

Deep yellow are the following: Mandibles except tridentate apex and extreme base, clypeus, sides of face to level of base of antennæ, stripe on scape in front (this stripe is reduced or absent in the paratypes), large backward-directed stripe-like spot above each eye. Stripe on each side of the anterior margin of the mesonotum, tubercles entirely yellow except on their anterior face, tegulæ in front, small spots on axillæ (absent in one of the paratypes), larger and more stripe-like maculations on scutellum that converge but fail, due to a broad separating area of black, to unite posteriorly. Legs maculated as in the female, except that the dots on the hind coxæ seem to be lacking and that the male specimens among themselves show variability in the development of the stripes on the femora (those on the front femora being in two of the paratypes absent or spot-like). The bands on tergites 1-2 and usually 3 medianly interrupted but decreasingly so, those on 4 and 5 merely emarginate medianly. The emarginations on each side above (which on tergite 1 sometimes produce a four-spotted condition) have a stronger laterad orientation than is the case in the female above described, though a laterad orientation has been noted in females of *clypeodentatum* proper. Tergite 6 with two large suboval inner spots and two smaller outer maculations (type) or with a band that may present the extremes of almost complete entirety on the one hand, or on the other almost complete penetration by the lateral emarginations (paratypes). Tergite 7 is in the type wholly black, in the paratypes with a maculation of variable size on each of the lobes.

This variety has been named *Anthidium clypeodentatum lutzii* in honor of Doctor Frank E. Lutz, Curator of Entomology in

² Ruth Isensee, "A Study of the Male Genitalia of Certain Anthidiine Bees." *Annals, Carnegie Museum*, XVII, Nos. 3-4, June 27, 1927.

the American Museum of Natural History, who has been the inspiration of my entomological work through a decade of close association.

The relationship of *clypeodentatum* to *psoraleæ* still continues to puzzle me. The inclination to associate Swenk's female with Robertson's male is strengthened by the discovery in southern California of insects belonging to these supposedly different species that yet show virtually the same direction of variability. The stumbling block is still the female that Robertson associated with the male of *psoraleæ*. Some of the differences between this female and *clypeodentatum* I attempted to reconcile in the Canadian Entomologist, Vol. 60, pp. 214-215, but an outstanding point of difference still remains: the six-toothed condition of the mandibles in *clypeodentatum* and the seven-toothed condition of the mandible as described for *psoraleæ*.

Generalization is usually perilous, but the highly maculated variety above described seems to lend support to the impression that the Anthidiinæ of California, and particularly those of southern California, tend to show a richness and fulness in their ornamentations that often differentiate them from their close relatives in the states to the north, just as a tendency to red manifests itself in the Anthidiinæ of Florida.

Anthidium palmarum Ckll.

Males of this species were collected by Professor Timberlake at Riverside, March 21 to May 26, on various species of *Phacelia*—*ramosissima*, *distans*, and *hispida*. On *P. hispida* also was taken a male from Owens Valley, caught twelve miles from Olancho on the road to Darwin, May 2, 1927. Yet another male was secured April 30, 1927, in the Mohave Desert, south of the Arawatz Mountains, on *Aster tortifolius*. A female was taken April 2, 1927, at Palm Springs, California—the type locality of the species—visiting *Phacelia crenulata*.

Anthidium xanthognathum Cockerell

The records for this rather rare insect, known thus far only from the type and paratype, are extended through the capture

of two specimens by Professor Timberlake at Riverside, California—the one on May 26, 1925, taken while it was “resting on ground with wad of pale pollen probably from *Lotus scoparius*;” the other on May 27, 1925, on *Lotus scoparius*. A third specimen was caught by E. P. VanDuzee in San Diego County, California, May 19, 1913 (collection of Cornell University). The specimens have the markings of Professor Cockerell’s variant from Soboba Springs, California.

Anthidium paroselæ Cockerell (?)

New Record from Arizona

With some hesitation there are assigned to *Anthidium paroselæ* Cockerell instead of being described as a new species four specimens—two males and two females of rather distinctive structure. These were caught by Professor Bradley at S. Carlos, Arizona, May 12–13, 1913. The females have the entirely yellow clypeus, bright yellow maculations, yellow and ferruginous legs, and partly ferruginous flagellum indicated in Professor Cockerell’s key (Bulletin of Denison Univ., Vol. XI, 1898, p. 62). The associated males of these San Carlos females run to *paroselæ* in Professor Cockerell’s later key (So. Cal. Acad. Sciences, Vol. III, 1904, pp. 56–58).

In 1900 Professor Cockerell, writing in Ann. Mag. Nat. Hist. (7) V, described the male allotype of *paroselæ* as having a pygidium “much as in *Porteræ*.” The lateral lobes of the pygidium in the insects before me are rather bluntly triangular whereas in *porteræ* they are rather broadly rounded, almost subtruncate. The description of 1900 goes on to say that the last ventral segment is not spined. As comparison is drawn throughout to *porteræ*, I have assumed that this statement was made by way of emphasizing the absence in *paroselæ* of the large median spine on the apical ventral segment that is so characteristic of *porteræ*. Strictly speaking, the statement “not spined” would fail to apply to the males from San Carlos, as they have on each side of their apical sternite a tooth with a spinelike tip.

Some of the other structural features of these San Carlos insects seem worthy of emphasis. The head in the female is

unusually broad, reaching well to the level of the outer rim of the tegulæ. The reflexed brownish-hyaline apical edge of the clypeus is in this sex not in the least emarginate but broadly rounded at the middle and slightly irregular at the sides (but without evidences of distinct teeth). The antennæ of the female are very short, about equal to the distance from the vertex to the apex of the clypeus but falling far short of spanning the width of the head. The punctation is rather fine, dense on the vertex and thorax above, sparse on the abdomen, especially the basal portion of the several tergites. Segment 6 is angulated on each side but without evidence of lateral teeth, the broad apical portion widely angulate to subtruncate.

In the male the head is distinctly broader than long, extending on each side beyond the mesonotum but not, as in the case of the female, quite reaching to the outer extremity of the tegulæ. The clypeus is not in the least emarginate along its apical middle, differing in this respect from many other male *Anthidium*. The antennæ of the male are distinctly longer than the head, about equal to the width of the head. The punctation is, as might be expected, like that of the female. The lateral teeth of segment 6 are straight. The lateral lobes of the pygidium are subtriangular with a slender median spine between. The terminal segment of the venter has a shiny raised apical portion that is flat to slightly concave above but of rounded somewhat U-like outline as it encroaches upon the base. This raised portion occupies more than half of the segment and terminates on each side in a broad, outpointing tooth with rather spinelike tip.

The insects are even smaller than Professor Cockerell specifies—in the case of the females approximately 8 mm. as against “about 10 mm.” indicated for the type, and in the case of the males $9\frac{1}{4}$ mm.

The structural characters above noted seem to separate these insects rather decidedly from *porterae* and it is still open to doubt, therefore, whether they are correctly assigned to *paroselae*, which, judging from Professor Cockerell's description, resembles *porterae* at least superficially. Only comparison with the type material could determine whether they are specifically distinct.

If they be *paroselæ*, they are the first record of that insect from Arizona, all of the previous records being from New Mexico.

***Anthidium cockerelli*, new species**

A single male, taken by Professor Timberlake, April 19, 1925, near Oasis, California, as it was visiting *Cercidium torreyanum*, has genitalia like those figured by Miss Ruth Isensee for *A. pondreum* Titus. It is open to doubt whether in other respects it resembles *pondreum*. Its markings are cream-colored instead of "deep yellow." It has no maculations on the "anterior portions of mesothorax," or on the axillæ. The lateral halves of the abdominal bands have deep and rectangular emarginations; they are not merely "notched." The pile is whitish to gray, in no place "ochraceous." Finally the venter is "polished" only on the last segment and restrictedly on the basal portion of the other segments, the apical portions being broadly punctate. Other possible differences are brought out in the description that follows:

Male.—Length 10 mm. Black with cream-colored markings. Head considerably broader than long; the pale green eyes converging below. Apical contour of clypeus very faintly bilobed due to a slight nick-like emargination at its center—somewhat intermediate in type between the apically rounded to truncate clypeus of the putative *paroselæ* males from Arizona and the apically emarginate clypeus of many other species. Labrum with two tuberculate prominences. Punctures relatively fine: at the base of each of the abdominal tergites sparse and scattered, on the apical rims arranged here and there in rather chain-like groupings with usually more than the width of a puncture separating one string from another. (*A. pondreum* is described as "closely punctured.") The pygidium also very similar to that of the putative *paroselæ*, the lateral lobes a little less pointed, a little more vaguely triangular than in that insect. The last ventral segment of *cockerelli* is, on the other hand, rather different from that of the Arizona specimens believed to be *paroselæ*. The carina-like boundary that separates the apical and basal portions of this segment does not bulge out broadly and rather gradually as it approaches the base but in contrast is rather straight in outline except at its middle, where it is abruptly V-shaped. This forward-pointing V-shaped projection in the outline is symmetrically opposed by a ferruginous, slightly bifid but otherwise similar V-shaped, backward-pointing extension at the middle of the apical extremity of the sternite—a development lacking in the putative *paroselæ*. Lateral teeth are present on this

sternite but they are little developed and decidedly obtuse. The sternite resembles rather closely that of specimens of *collectum* before me except that the lateral teeth are in *collectum* much more developed and spine-like. The propodeum is covered along the base of the triangular enclosure with large, rather vague and sparse punctures that thin out toward the middle. The large apical region of this enclosure is devoid of punctation and polished.

So similar in some of its structural features to the putative *paroselæ*, yet rather different in others, *cockerelli* departs from it sharply in the color and character of its maculations. The following parts are cream-colored: mandibles except teeth, clypeus except two basal black spots, cuneiform marks filling space between clypeus and eye and terminating at level of base of antennæ, spot above each eye, large spot in front and small spot behind on otherwise ferruginous tegulæ, two widely separated stripes on the scutellum (but in the only specimen before me not on the axillæ), spot on the hind coxæ, stripes from end to end on the front and middle tibiæ, basal and apical spots on the hind tibiæ, all of the metatarsi externally. The abdominal maculations are also cream-colored. On all of the segments the bands are broadly interrupted in the middle and, except on the seventh, deeply and rather squarely emarginate above on each lateral half. So deep is this emargination that on segments 1-3 it has completely cut through the maculations, resulting in a four-spotted condition. The flagellum shows a tendency to be somewhat ferruginous and its third joint is brightly so within.

The insect is covered with fairly long grayish to white hair, that is at no point so concealingly dense and matted as on the face of the putative *psoraleæ* or of *rohweri*. Bristle-like hairs fringe the apical border of some of the abdominal maculations, especially those on segments 4-5.

This insect is named in honor of Professor T. D. A. Cockerell, whose extensive studies on the Anthidiinæ are only a few of the many accomplishments that have resulted from his tireless researches in different fields of biology. A *Heteranthidium* has been previously named for Professor Cockerell but it has been relegated to the synonymy. In the belief that *Anthidium* is sufficiently distinct from *Heteranthidium* and the other pulvilli-bearing forms to survive as an independent genus, the name of *cockerelli* is here revived.

Anthidium rohweri Schwarz

New Record from California

A single male of this species taken by Professor Timberlake north of Indio, April 23, 1927, as it was flying about *Larrea*,

represents the first record of this insect from California. Subsequently there was sent me a specimen caught April 15, 1928, by W. H. Thorpe "on muddy ground." The locality record for this specimen reads: Salton Sea, near Fish Springs, Colorado Desert, California.

Anthidium atripes (Cresson) for *Anthidium emarginatum*
atripes Cresson

Cresson described this putative variety of *emarginatum* on the basis of a single male. I have recently examined his type and in my estimation it is not a variety of *emarginatum* but a distinct species. Cresson's description does not include several of its distinguishing characteristics. Especially to be noted is the fact that it is largely covered with black hair instead of the light hair so characteristic of the vast majority of the males of *Anthidium*. Structural features worth recording are a deep curvilinear emargination on the clypeus and the sparsity and fineness of the punctures on the apical rims of the several segments of the abdomen.

In his paper contributed to Proc. Cal. Acad. of Sciences (Vol. XIV, No. 15, 1925, p. 354) Professor Cockerell has associated with *atripes* as its female an insect from Meadow Valley, California, that accords, I find, with what I subsequently described as *longispinum* (Amer. Mus. Novitates, No. 253, March 1, 1927, p. 6). It seems to me that *longispinum* is structurally too different from *atripes* to rank as its mate. In contrast to *atripes* the rims of the segments of *longispinum* are covered with densely crowded punctures, while the punctation at the base of the several segments is also dense and even somewhat coarse compared to the sparsely dotted, rather polished surface of this basal portion in *atripes*. Moreover, it would be unusual if a female with light ventral scopa such as characterizes *longispinum* were the mate of a male that is dark-haired both above and below on the abdomen. Where differences occur between the sexes of *Anthidium*, it is usually the female that has the darker ventral scopa. The putative affiliations of *longispinum* will be discussed under the heading of *Anthidium banningense*. At this point I desire, however, to describe what I believe to be the true female

of *atripes*, based on a single specimen taken by Professor Timberlake on July 11, 1927, at Big Pines Camp, California, as it was visiting *Lotus davidsoni*.

Female.—12 mm. Black with a few cream-colored maculations and with predominantly black pile. Head slightly wider than long, the eyes converging below. The mandibles sexdentate; the apical contour of the clypeus slightly reflexed, faintly serrate along its middle, becoming strongly so on each side, with the penultimate lateral teeth rather prominent. The punctation dense but rather fine on the abdomen; the punctures on the apical rims of the segments tend to arrange themselves chain-wise with often several times the width of a puncture separating one chain from another. Viewed from above the contour of segment 6 is rounded, without marked angulation or lateral teeth.

No maculations on the face. A backward-directed cream-colored oval spot above each eye and maculations of the same color as follows: tubercles, tegulae except for a large blackish-brown pupil, a stripe on each side of the anterior margin of the mesoscutum, an oval spot on each side of the scutellum, medianly interrupted bands on segments 1-2 that are anteriorly emarginate on each lateral half, large clavate median maculations on segment 3, small oval median maculations on segment 4. Segments 5-6 as well as the legs immaculate.

The pubescence throughout deep black except for gray hairs from the level of the antennae to the top of the head (interspersed with a tuft of unbranched black hairs in the region of the ocelli), and gray hairs on the thorax above, behind the wings, on the part of the mesothorax and metathorax immediately beneath the wings, and on each side of tergite 1.

In its close approach to an immaculate condition, in its dark ventral and dorsal pubescence, and in the fine and sparse punctation of its abdominal rims this female seems much closer to *atripes* than does the previous claimant, *longispinum*.³

³ Since writing the above I have received through the kindness of Professor Timberlake a male and a female belonging to the Los Angeles Museum. These were collected by Doctor Davidson presumably in Bear Valley, San Bernardino Mountains, California, and confirm the impressions previously arrived at. The female from Bear Valley differs from the female

Anthidium banningense Cockerell and its female, *Anthidium longispinum* Schwarz

The claim of *longispinum* to rank as the female of *atripes* is no longer tenable in view of the discovery of the true mate of *atripes*. With what insect shall we then associate *longispinum*? I am convinced it is the female of *banningense*. *A. banningense* has exceptionally few maculations on the legs and *longispinum* is devoid of maculations on these parts. The apical rims of the abdomen are in both densely punctured. The pygidium of *A. banningense* is much like that of the males of *A. maculosum* and *A. maculifrons*, and these two species are the only ones before me that in the female sex have spines on the apical segment comparable in length and acuteness to those of the putative female of *banningense*. (For a comparative study of the pygidia of these insects the reader is referred to Plate XII.)

As further evidence in sustaining my contention I would mention the locality records cited by Professor Cockerell (Proc. Cal. Acad. Sci., 4th Series, Vol. XIV, 1925, pp. 354-6) for his "atripes" females (= *A. longispinum*) and those cited for his *banningense* males. All of the places where "atripes" females

just described only as follows: the axillæ as well as the scutellum are maculated, and the band on tergite 1 has imbedded black spots instead of emarginations above on each side. These slight differences might well be due to variability within the species.

The male differs from the type in having maculations on each side of the anterior margin of the mesonotum and on the scutellum. Not merely tergites 6 and 7 but tergite 5 as well are immaculate. Unlike the female, both the type and the male from Bear Valley have grayish white hair on the face in the region below as well as above the antennæ, but the hair on the cheeks is blackish brown. As in the female, the dorsum of the thorax is in these males covered with gray pile; the gray pile on the pleura extends farther down than in the female. The male specimen from Bear Valley has whitish pile on tergites 1 and 2. The rest of the abdomen, both above and below, like the legs is covered with black pile, according with the type. Structurally the two specimens seem alike. The pygidium, more easily studied in the Bear Valley male than in the type, is a little like that of *palliventre* (= *californicum*). The lateral lobes are of about the same width in both species, but those of *palliventre* are incurved at the apex and lack one or more serrations along their inner edge, distinguishing characteristics of the Bear Valley male at least.

were found can be matched in his record by places where *banningense* was taken. In fact, there is only one place where a catch of *banningense* was not paralleled by one of "*atripes*."

Confirmatory data are supplied in the locality records of the new material before me. Among Professor Bradley's specimens are a male of *banningense* and a female of *longispinum*, both taken at Klamath Lake, Oregon, July 20, 1927. Among the specimens loaned by Professor Scullen are a series from Wildhorse Canyon, Steens Mts., Oregon, which he secured July 5, 1927, at elevations ranging from 4270-6000 feet. The males are *banningense*; the females, *longispinum*.

In the collection of Professor Timberlake there are four male *banningense*, unaccompanied, however, by females of *longispinum*, from the following localities: Nevada County, California, and Big Pines Camp, California, July 12-13, 1927. The specimens from the latter place were taken on *Phacelia heterophylla*.

Callanthidium illustre (Cresson)

New Record from New Mexico

This species, described from Nevada and reported from various localities in California, extends into New Mexico as is evidenced by specimens from Jemez Springs. These were secured July 5, 1913, by John Woodgate and are now in the collection of Cornell University.

Callanthidium conspicuum consonum (Cresson)

for *Anthidium illustre consonum* Cresson

Cresson described *consonum* as a variety of *illustre*, misled apparently by the fact that *consonum* shares with *illustre* the L-shaped marks on the mesoscutum. But, as other species illustrate when abundant material is available, such markings are apt to be highly variable and should not in my estimation take precedence over structural differences. Structurally *consonum* belongs with *conspicuum*, having like that species six teeth on the mandibles of the female, whereas *illustre* has seven. The inner teeth on the apex of segment 6 of the abdomen are slightly less rounded, rather more acute, than in *illustre*. Finally a median ribbon of black, absent in *illustre*, bisects segment 6 of the females

of *conspicuum* and *conspicuum consonum*. Along the center of this ribbon is traceable a glistening carina.

Two female specimens collected by Professor Timberlake, July 14, 1927, at Big Pines Camp, California, at an elevation of 7400 feet agree fairly closely with the type of *consonum*, although in neither is the carina just mentioned so distinct as in the type. Both of these specimens were taken at *Castilleia plagiotoma*. A male from the same locality, taken on the same day as the females but at *Cordylanthus nevinii*, is almost certainly the same species as they.

The assignment of *consonum* to *conspicuum* rather than *illustre* derives additional support from this male, which in Professor Cockerell's key (Ent. News XX, p. 262) runs to *conspicuum*. However, this male, contrary to Professor Cockerell's specimens, agrees with the female of *consonum* in having L-shaped marks on the mesoscutum and the band about the head uninterrupted on the vertex. This justifies the retention, temporarily at least, of the varietal name *consonum*. A larger series is required to decide whether the variety is constant or not.

Anthidiellum ehrhorni Cockerell and its Undescribed Female.

Professor Cockerell described this insect from a male taken in the Mohave Desert, California, and later reported the species also from Grossmont, near San Diego, California. A male of this species was taken at Furnace Creek, California, May 1, 1927, by Professor Timberlake. With this male I associate four females, one of which was collected in San Bernardino County, California, by E. J. Vosler, and three by Professor Timberlake at Palm Canyon, California, April 5, 1925, and at Riverside, California, May 26, 1925, and June 10, 1926. Professor Timberlake's specimens were taken respectively on mesquite, *Lotus scoparius*, and *Stephanomeria virgata*.

In its maculations the female of *Anthidiellum ehrhorni* is deceptively like *Anthidiellum robertsoni* Ckll., sharing with that species the immaculate clypeus, the lateral face marks terminating at the level of the base of the antennæ, the occipital band extending without interruption from slightly beyond the summit of one eye to slightly beyond the summit of the other eye, the

marks on the tubercles, on the fore part of the tegulæ, and on each side of the anterior margin of the mesonotum, the stripe on the outside of the fore and middle tibiæ, and the basal spot on the hind tibiæ (sometimes there is a spot in addition at the apex). Instead of having merely the scutellum maculated, as is usual in *A. robertsoni*, the female of *ehrhorni* has the axillæ as well as the scutellum heavily banded, in this respect agreeing with its male. The bands on segments 1 and 2 of the abdomen also reveal the affinity of these females and serve to differentiate them from *A. robertsoni*. In both sexes of *A. ehrhorni* the maculations on tergite 1 are not confined to a spot at each side, as is usual in the male and female of *A. robertsoni*, but take the form of a medianly interrupted arcuate band that is narrow inward but greatly thickened at each of its lateral extremities. In fact, it is much like the band on tergite 2 of *A. robertsoni* except that the median interruption is broader. The band on tergite 2 of both sexes of *A. ehrhorni*, while also medianly divided, is, on the other hand, much thicker and heavier, the lateral halves being only slightly emarginated posteriorly. On tergites 3-5 the median spots are well developed but the lateral maculations in the females under consideration are either inconspicuous or absent. Tergite 6 of the female has two median maculations much like those of the corresponding sex of *A. robertsoni*; in one of the females of *A. ehrhorni*, however, these maculations do not find place.

While in its maculations and its size the female of *A. ehrhorni* is much like that of *A. robertsoni*, its structure is distinctive and readily enables one to separate it from *A. robertsoni*. Especially to be noted are two structural peculiarities: (1) The prolongation apically of the clypeus, the edge of which projects, slightly uptilted, to cover rooflike the inner quarter or third of the mandibles. In profile the clypeus is thus gradually, not abruptly, concave on its apical half, suggestive in this respect of the female of *Heteranthidium bequaerti*. (2) The prolongation of the apex of segment 6 medianly with an emargination of variable width that is rather suggestive of the similar structure in the female of *Anthidium clypeodentatum*. (Fig. 2B of Plate XII represents a specimen with rather broad emargination). Other structural differences are: the mandibles of the female of *A. ehrhorni* have

large, relatively sparse punctures basally on a practically smooth, shiny surface and minute dense punctures and striations apically; in *A. robertsoni* the mandibles are more striately punctate at the base and virtually impunctate, although microscopically roughened, at the apex. In *A. ehrhorni* there are no marked irregularities in the inter-ocular region other than the punctation, whereas in the female of *A. robertsoni* well-developed, semi-impunctate ridges separate the lateral ocelli from the anterior ocellus. In *A. ehrhorni* the apical rim of tergite 4 is relatively regular in outline; in *A. robertsoni* this segment is rather strongly down-bent in outline at each of its lateral extremities. To these structural differences others might be added, but the enumeration has supplied, it would seem, sufficient characters to facilitate the differentiation of the two species.

Anthidiellum notatum (Latreille) and its Allies

Two females taken in southern Arizona by F. H. Snow, August, 1902, and now in the collection of Cornell University, agree in all details with the female from New Mexico that Professor Cockerell described as *gilense* except that one of them has spot-like maculations on tergite 6.

Structurally these Arizona insects are very similar to the females of *notatum* and of *robertsoni* but, apart from differences in the maculations (rather slight as between these specimens and *notatum*), they are separable at once because of their greater size. They are very close, too, to what Swenk has indicated as the female of *boreale* Robertson. They have, however, yellow maculations on their red legs in agreement with *notatum* and *gilense*, whereas Swenk's putative female of *boreale* has "wholly clear red" tibiae and tarsi.

In the United States National Museum there is a large series of *Anthidiellum* from Kerryville, Texas, one specimen of which, as representative presumable of the entire group, bears the designation *gilense* in Professor Cockerell's handwriting. Some of the females lack the maculations on the sides of the clypeus, in this respect approaching *robertsoni*. All of them have red legs with yellow stripes on the anterior and middle tibiae, and

a basal spot on the hind tibiæ. Their axillæ are maculated as well as their scutellum.

The males accompanying this series from Kerryville lack a median carina on segment 6, which Robertson specifies for *boreale* and which I find present on that segment also in California males of *robertsoni*. The Kerryville males thus approach in this respect *notatum*. However, it seems to me that too much stress should not be laid on the presence or absence of a carina on this segment. As pointed out later on in this paper, p. 403, considerable variability in respect to this structure may exist even within a single species. As the pygidium of the male seems to be identical in *notatum*, *gilense*, *boreale*, and *robertsoni* and the presence or absence of the carina is of questionable significance, it seems to me that the last three should be considered varieties of *notatum* rather than independent species.

Cells of *Anthidiellum notatum rufimaculatum* Schwarz

Through the kindness of Mr. F. M. Jones, the American Museum of Natural History obtained two cells collected by him during a sojourn at the Royal Palm Park, Florida. From one of them a female of *Anthidiellum notatum rufimaculatum* had emerged and the other cell subsequently yielded a male of this species. The cells have been depicted by Mrs. E. L. Beutenmüller and appear as Fig. 1A (the cell of the male) and Fig. 1B (the cell of the female) on Plate XII.

A certain difference in the workmanship of these two cells is apparent. Not only is the cell from which the male emerged larger but its surface is of a different character. Whereas the cell that held the female is throughout prevailing smooth with only now and then minute irregularities, the cell of the male is here and there rugose in comparison, with lumps of resin jutting from its surface. The difference in the workmanship is especially noticeable at the base of the necklike extension: the cell that contained the male has in this region deep folds or channels that are in contrast to the ridgeless smooth surface of the corresponding area in the cell that yielded the female. A funnel-like expansion at the end of the necklike extension characterizes

the cell of the male specimen; the near absence of such a funnel-like expansion in the cell of the female may be due to injury rather than to imperfect development.

These differences are probably merely differences of technique, signifying no more than a difference of degree in skill on the part of the artisan. They are noted here merely as facts without any desire to claim that a difference of architectural method is applied in the case of the abode of the male from that used for the housing of the female. More nest material would be needed to justify such a conclusion.

The cell proper measures in the case of the male about 11 mm. in length, in that of the female about 9 mm., while the necklike extension adds in each instance another $1\frac{1}{2}$ mm. Fabre states that both *septemdentatum* and *bellicosum*, European Anthidiinæ that build their cells in empty snail-shells, assign to the male the larger quarters near the orifice of the shell, while "the less spacious back room contains a female." It is doubtful, however, whether a similar disparity in size as between the cells of the male and the female obtains regularly in *Anthidiellum notatum* var. *rufimaculatum*. Of the specimens of this bee that have come to my attention it is more often the male than the female that is the smaller, and that in the economy of nature might therefore seem destined to content itself with the smaller cell. In the case of a European species of this genus, *Anthidiellum strigatum* Panzer, both Kirschbaum (Jahrb. d. Nassauisch. Vereins f. Naturkunde, Vol. XXV, 1871, pp. 446-447) and Schlechtendal (Jahresber d. Vereins f. Naturkunde in Zwickau, 1872, pp. 12-15) state or imply that the cells observed by them were of the same size.

According to these and other authors *A. strigatum* attaches its cells to a stone, arranging them in a row, one cell next to the other and similarly oriented. The cells of *notatum rufimaculatum*, on the other hand, seem to be placed singly and on vegetation. The cell containing the female was attached to a scrub palmetto near the tip of one of the divisions of the leaf; the cell from which the male emerged was fastened to a pine-needle. Other cells, similarly placed, were noted by Mr. Jones. All of

the cells which came under his observation were in the open pine woods; no cells were noted in the vegetation of the hammock.

Since the above was written I have secured through the kindness of Professor Timberlake a cell from which a male of *Anthidiellum ehrhorni* emerged. The cell was obtained on a mesa ten miles south of Yuma, Arizona, on January 19, 1928, and the insect emerged on March 8. It is interesting to note that this cell was attached to a bush and that its architecture is in important respects similar to that of *A. notatum rufimaculatum*. There is a necklike extension at the free end of the cell as in *rufimaculatum* and there are evidences of channeling as the neck is approached, though the folds are not so well marked as in the cell of the male of *rufimaculatum*. At its upper end the cell of *ehrhorni* has an almost barrel-like truncation, from the center of which juts forth the neck, as contrasted with the almost conelike slope of this portion in *rufimaculatum*. There are no knoblike irregularities on its surface, such as those noted for the cell of the male of *rufimaculatum*. The length of the cell including the neck is somewhat more than 9 mm. The neck itself is about 1 mm. in length but, as its tip seems slightly mutilated, it may originally have been longer and possibly even with a funnel-shaped termination. The enclosed cocoon is parchment-like and of a deep brown, almost matching that of the cell itself.

Dianthidium parvum and Some of the Smaller Western Representatives of the Genus *Dianthidium*, Including One New Species (*D. dubium*) and Two New Varieties (*D. ulkei riparii* and *D. parvum swenki*).

In 1878 Cresson described his species *parvum* on the basis of a female of rather restricted maculations that was obtained from Colorado, and with it he associated a male from the same state that like the female bore apparently no specific locality record although both the specimens had this in common: they were taken by the same collector, Ridings. The description of the male leaves some doubt as to the actual character of the insect. The apical segment is said to be "shaped much as in *interruptum*." The *interruptum* referred to is a species of

Say, later renamed *sayi* by Cockerell because of the prior use of *interruptum* by Fabricius for an Old World species. In *sayi* the pygidium is truncate with the median tooth projecting beyond the level of the broad, rather square-cut lateral lobes, constituting a brief interruption in an otherwise unbroken straight apical contour. Whether this is the type of pygidium that Cresson had in mind when he said "shaped much as in *interruptum*" or a more nearly tridentate pygidium, presently to be referred to again, in which the central tooth is clearly separated from the still fairly broad lateral lobes and ends on a level with them, will probably never be known, for Cresson's allotype is lost. Furthermore, there is no certainty that Cresson's male and female were correctly associated.

In 1900 Cockerell assigned to *parvum* males having the pygidium truncate, thus by implication accepting Cresson's statement as applicable in full to the *sayi* type of pygidial structure. Later, in 1909, Cockerell revised his opinion and assigned to *ulkei* specimens previously referred to *parvum*. Of the *ulkei* male he says: "The seventh segment of the male abdomen is broadly truncate, yellow with the edge hyaline, the lateral corners rounded, and the small median projection not bounded by notches." He does not say anything about the pygidium of *parvum*, but the implication at least is that it is different from *ulkei*. Swenk, in 1914, differentiated the male of *ulkei* from the male of *parvum* as follows: "The male of *ulkei* differs at once from *parvum* ♂ in the quite different pygidium, *parvum* having distinct notches at the sides of the median apical tooth which are lacking in *ulkei*." Swenk's impressions were based on a large series of insects, some of them bred from cells he had collected, and his interpretation of the male of *parvum* is probably, therefore, more to be relied upon than the interpretation of Cresson, who had only one male before him and that possibly not from the same locality in Colorado as his female type.

The description of *ulkei* was based on a single female from Utah, which both Professor Cockerell and Professor Swenk have assumed—and I think correctly—is essentially the same insect as that found in states to the eastward, Professor Cockerell recording it from Colorado and New Mexico, Professor Swenk

from Nebraska. Professor Swenk collected a large series of insects from various localities in the last mentioned state that he assigned to *ulkei*. They showed great variability in their ornamentation and because of this he widened the conception of *ulkei* to include females that approached rather closely the insect of limited maculations represented by the type of *parvum*. It is not quite clear from Professor Swenk's account whether each of the several localities in Nebraska represented by his specimens offered this intergrading diversity but, in view of the fact that he rejected the possibility of local races and treated all of his specimens as members of one group, I have assumed that no differentiation between the specimens of this locality and that was possible.

The Pacific Coast specimens of *ulkei* that have come to my attention present, however, rather clearly marked fixity of ornamentation as between this locality and that, and raise question whether valid varieties of *ulkei* are not involved. All of the eighteen undermaculated specimens of *ulkei* from California that I have examined come from one locality, Riverside, where they were secured by Professor Timberlake, nor are there among the specimens from this locality any that would be assignable to the more highly maculated group. Furthermore, I have had before me a series of six males and two females, taken by Professor Scullen at Three Sisters, Oregon, Aug. 7-15, 1926, at elevations ranging for the most part from 4,650 to 4,700 feet. All of these insects are of the undermaculated group of *ulkei*.

Recognition of the specimens from Riverside as a variety receives additional justification through the circumstance, pointed out to me by Professor Timberlake, that their punctation differs from that of the fully maculated and the more restrictedly maculated specimens of *ulkei* from Colorado. As he states in a letter: "This Riverside form is so readily distinguished by the sculpture, especially of the mesoscutum, which is quite shiny between the punctures but dull subrugosely punctured in *ulkei*, that I would not hesitate to treat it as distinct, unless I had evidence of intergradation in this respect as well as in maculation."

For the Riverside specimens I propose the name *Dianthidium ulkei riparii*. The punctuation of these specimens is, as Professor Timberlake points out, especially distinctive on the thorax above, but the punctuation of the vertex also is somewhat finer than in Rocky Mountain specimens and the punctuation of the abdomen is a little sparser.

The specimens from Three Sisters, Oregon, incline in their punctuation rather to the inland or Rocky Mountain group of *ulkei* with subrugosely punctated mesoscutum. Though they are consistently undermaculated, I think it advisable to withhold designating them yet another variety of *ulkei* in deference to the observations of Professor Swenk, which were based on a much larger series of *ulkei* from Nebraska.

The undermaculated females of *ulkei* (including those of *ulkei riparii*) have the abdominal bands emarginate on each side behind; the fully maculated females lack such emarginations on at least segments 3-5. I emphasize the character of the bands rather than the other maculations because both the type of *ulkei* and what are, I believe, the females of Cockerell's *davidsoni* have bands of a similar character. These putative females of *davidsoni* usually have the clypeus wholly yellow (with rare exceptions the clypeus of *ulkei* is merely more or less broadly maculated with yellow on each side) and segment 6 largely yellow (in the great majority of cases this segment is in *ulkei* either two-spotted or immaculate). How tenuous this distinction may become is indicated, however, by the presence among the *davidsoni* females from California of individuals that bear the earmarks of *ulkei*, while from Glenwood Springs, Colorado, there is a female that comes within the definition of *davidsoni*. On the basis of the female, it is to be doubted, therefore, whether *davidsoni* is even a well separated geographic race of *ulkei*.

The male of *davidsoni*, as represented by Cockerell's type (No. 9653) in the U. S. National Museum, has a truncate pygidium like that of the male of *ulkei* and the male of *ulkei riparii*. Like the female of *davidsoni* it usually shows a greater richness in the abdominal maculations than is the case in the majority of specimens of *ulkei*. Particularly may be noted the maculation of segment 6, which, as Cockerell indicates, is "yellow except the

overlapped base, a median basal pointed process, and two transverse subapical marks" (in all of these respects suggestive of the females associated with it). On the other hand, the distinction is not absolute. A California male before me with otherwise well maculated abdomen lacks the markings indicated for segment 6, while a male from Glenwood Springs assigned to *ulkei* might equally well qualify as *davidsoni*. Certainly the gap between *ulkei* and *davidsoni*, bridged here and there as it is by aberrant specimens in each supposed group, is much narrower than that which separates these two from the undermaculated group within *ulkei*, one division of which, following Professor Swenk, I have, temporarily at least, permitted to remain merged with *ulkei* proper because of structural similarity with the type, the other division of which, differentiated especially by its finer and more distinct thoracic punctation, I have given varietal rank as *ulkei riparii*. Certainly, if *riparii* is made merely a variety of *ulkei*, the much less easily differentiated *davidsoni* cannot claim independent rank, and I suggest that it, too, be made a variety of *ulkei*. The virtual identity of the pygidium and also of the genitalia in *ulkei*, *riparii*, and *davidsoni*, supplemented by other characters, seem to justify the treatment of these insects as members of one closely related group. (The pygidium and genitalia of *ulkei riparii* have been depicted as Fig. 2A and Fig. 2B respectively of Plate XIII. The genitalia are correctly represented from the angle from which they were drawn, but more often the stipes appear bent, even hooklike, at the extremity.)

Yet another series of specimens from California lent by Professor Timberlake present the anomaly of being structurally like *parvum* as above outlined, while in their maculations they closely approach the richness of ornamentation indicated for *davidsoni*. This is the insect two male specimens of which have been placed in the United States National Museum under *davidsoni* and regarding the puzzling character of which I commented in an earlier paper (Amer. Mus. Novitates, No. 226, Oct. 9, 1926, pp. 10-11). They differ structurally from the type of *davidsoni* (No. 9653) in having a tridentate pygidium of the *parvum* type instead of a truncate pygidium. While this structural difference in the male is determinative for that sex, certain supplementary

differences, more or less constant, may be noted. In the California males before me that accord structurally with the type of *davidsoni* the posterior emargination of the bands on segments 3 and 4 or the presence of imbedded black spots in the yellow of these segments are rare occurrences. In the series that has the pygidium of *parvum* such imbedded spots or shallow posterior emarginations can be noted almost invariably in the case of the bands of these as well as of the other segments.

The abdominal bands of the putative females of the *parvum*-like males show a much less pronounced tendency toward posterior emargination than is the case in their mates, but even in the females, at least a slight deepening of the coloration, linelike or specklike, near the apex of each lateral half of the bands, even to the inclusion of those on segments 3 and 4, suggests a vestige of the condition that obtains in the male. In the females that I have associated with *davidsoni* even these feeble earmarks of a posterior emargination are absent on segments 3 and 4 in all but two out of fourteen specimens. In the putative females of the *parvum*-like males the tendency for the halves of the band on the apical segments to coalesce does not seem so strong as in the corresponding sex of *davidsoni* and, if it manifests itself, usually takes the form of an only partially completed coalescence on segment 6. These attempted distinctions in the females are admittedly tenuous.

The most pronounced line of cleavage seems to be the ornamentation of the face, the wholly or largely yellow clypeus of the *davidsoni* females being in rather sharp contrast with the minute triangle of yellow that is tucked away in each lateral extremity of the clypeus in the females of the other group. In this connection it may be recalled that the female of the true *parvum* has the clypeus either wholly black or with much restricted maculations.

For this group, which is so like in structure to *parvum* and so similar in its markings to *davidsoni*, I propose the name *Dianthidium parvum* variety *swenki* in recognition of the valuable work that Professor Myron H. Swenk has done upon the Anthidiinæ and other groups of bees. Like *Dianthidium parvum baculifrons* Cockerell the female of this variety has a mark in front of the anterior ocellus, but the black part of the clypeus broadens rather

than narrows apically, the hind tibiae like the other tibiae are yellow instead of merely basally so, the sixth segment has conspicuous maculations instead of being entirely black, and the general appearance of the insect, with its maculated mesopleura and maculated under sides of front and middle femora, is so much more like *ulkei* and *ulkei davidsoni* than it is like the type of *parvum* (female) in the Academy of Sciences in Philadelphia that, were it not for the structural characters in the associated male, one would think it had no affiliation with *parvum*.

Assignable to *provancheri* because of their yellow markings rather than to *pudicum* are a series of nine males—all from Riverside, California—that are in agreement essentially with the type specimen (No. 9033) at the U. S. National Museum. Variability is shown by these specimens especially in the maculation of the hind tibiae, some of the specimens transcending the limit of variability noted by Titus in having the hind tibiae externally entirely yellow. But that they are all one species cannot, I think, be doubted in view of their structural similarity, their identity of locality, and the fact that the maculations of the hind tibiae intergrade from extreme to extreme. A more troublesome instance of variability is the presence of a well developed median longitudinal carina on segment 6 of some of the specimens, a feeble indefinite carina in others, and no carina at all in yet a third subdivision. I do not find any correlation between this structural variability and the variability of the maculations.

I prefer to consider *provancheri* a variety of *pudicum*. Both Cresson's type of *pudicum*, a male, and the type of *provancheri* Titus, likewise a male, have a median longitudinal carina on segment 6, and in both the maculations on the third tibiae are confined to the base and apex. I can see no important difference except that the maculations of *pudicum* are cream-colored, those of *provancheri* yellow, and this seems to me to have no more than varietal significance.

At this point it seems appropriate to discuss *Dianthidium consimile* Ashmead. A wrong impression seems to prevail as to the character of *consimile*, based on the supposition that Ashmead's description applies in part to the male, in part to the female. But Ashmead indicates that it is based on the female and exami-

nation of the type (No. 16698) in the United States National Museum leaves no doubt that every character mentioned in his description is substantiated by the specimen—a female from Los Angeles, California. This female has a completely maculated clypeus. It presents in other words a condition—very rare in the female sex—that is shared by the females associated with *dauidsoni*. From the female of that insect it seems to separate itself, however, through the posterior emarginations laterally on its abdominal bands and through the lack of a well developed subapical tooth on the mandibles. The rather smooth apical edge of the mandible may possibly be due to wear but among Professor Timberlake's specimens are four having mandibles of this character and at the same time maculations identical with or closely approximating the type of *consimile*. In three out of four of these the clypeus is largely or wholly yellow, in only one is it medianly traversed by a ribbon of black. In all of these specimens there are posterior emarginations on the abdominal bands. I believe these specimens should all be designated *consimile*.

It seems to me probable that *provancheri* is the male of *consimile*. Reasons have already been advanced for making *provancheri* merely a variety of *pudicum*. Females of *pudicum* before me have the same type of mandible, with a relatively smooth straight edge beyond the apical tooth, already indicated for *consimile*, so that the claims of that species to rank as a member of the *pudicum* group seem strengthened to that extent.

Ashmead's description of *consimile* is appended to a description of its nesting habits by Davidson. There is nothing to indicate that Ashmead had more than a single specimen of *consimile* before him, and that a female. Associated with *consimile* at the United States National Museum is, however, a male taken by Carl F. Baker and marked Cala. 2350. I included the characters observed in this male in a key (Amer. Mus. Novitates, No. 226, Oct. 9, 1926), believing at the time, in the absence of other evidence, that it was correctly associated with *consimile*. If, however, *consimile* and *provancheri* be different sexes of the same insect—or indeed even apart from this premise—this male, while in many respects close to "*provancheri*," is entitled to independent specific rank.

This male agrees well with certain males supplied by Professors Bradley, Scullen, and Timberlake in which a strong tendency toward red or at least reddish brown may be noted on the apical rims of the abdominal segments. Segment 2 like segment 1 is in this proposed new species usually 3-spotted, the result of a coalescence medianly of the normally divided halves of the band and the complete penetration of the band laterally by the emarginations. The middle tooth of the pygidium is of somewhat variable length, not always "fully twice the length of the lateral lobes," as indicated in my key (Amer. Mus. Novitates, No. 226, Oct. 9, 1926), but usually it is longer than that of *pudicum* and "*provancheri*." Its genitalia differ slightly from the condition in the *pudicum* group, especially in respect to the sagitta, as an examination of the figures on Plate XIII will indicate. The last sternite lacks the rather strong emargination that I have noticed in specimens of *pudicum consimile* (= *provancheri*).

Seven females, much like the type of *consimile*, except that they have a ribbon of black traversing the clypeus, and reddish staining on the apical rims of the abdominal segments, are associated with the males just discussed. Five of these have the lateral halves of the band on tergite 2 completely subdivided by the posterior emargination, presenting a condition like that above indicated for the male.

It had been my first intention to describe this group as merely a variety of *pudicum* but the structural differences, though slight, seem to make a specific separation from *pudicum* desirable. I, therefore, name it *Dianthidium dubium*. It may be mentioned that the color of the maculations in *dubium* ranges from pale to strong yellow. Possibly varietal distinctions may ultimately seem justified on this basis, duplicating what has been done in the case of other closely related insects within the Anthidiinae, but until a large number of specimens from many localities is available, such fine splitting seems premature.

Of the males of *D. dubium* one was collected by Professor Timberlake on June 24, 1926, in the Yosemite Valley on *Lotus*; three by Professor Scullen on Oregon Mt., Josephine Co., Oregon, July 5, 1925; one by Professor Bradley at Three Rivers, Cali-

foria, Aug. 13, 1927, and a second specimen from the same locality by Culbertson; and the remaining five have the designation State Insectary, California, and were possibly collected in the mountains east of Sacramento. One of these bears the following entry on the label: "Reared from nest on Sweet Birch, Dutch Flat, California, May 19, 1912, Branigan, Col."

The association of the females with the males on the ground of their maculations receives additional support from the fact that the locality records for the two sexes closely correspond. Thus the females were taken at the following places: one by Professor Timberlake at Three Rivers, California, June 10, 1925, while visiting the flowers of *Pentstemon*; five by Professor Scullen on Oregon Mt., Oregon, July 5, 1925; and one reared from nest on Sweet Birch, Dutch Flat, California. The reared pair from Dutch Flat have been made the holotype (♂) and allotype (♀) of *D. dubium*.

A few specimens remain as an unassimilated residuum. I cannot place them with any assurance, yet hesitate to complicate things by giving them even varietal rank. There are two males which were obtained from "cemented gravel nest" collected on Mt. Lowe, Cal. They have genitalia much like those of *D. dubium* but they do not show the tendency toward reddish-brown noted in the abdominal markings of that insect. There are also a male collected June 27, 1926, in the Yosemite Valley on *Monardella lanceolata*, a female with corresponding data, and two females from Mount Diablo, California, taken Sept. 22, 1912. The male has the pygidium of *pudicum* but abdominal maculations much more nearly like those of *D. parvum swenki*. The female with corresponding data has mandibles like those of *D. pudicum consimile* but its abdominal bands are of the fully developed type associated with *D. parvum swenki* and *D. ulkei davidsoni*. The two females from Mt. Diablo have the abdominal bands emarginate behind on each side and as such might seem to belong to *D. pudicum consimile* but they are so much larger than the four females here consigned to *consimile* and in general appearance seem so much closer to the puzzling female from the Yosemite Valley that it seems wiser to place them tentatively with her.

Professor Timberlake's careful floral records, supplied in the case of practically all of his specimens, and other data are summarized herewith:

The group designated *ulkei riparii* consists of five males and twelve females, all taken in 1925 at Riverside. The dates for the males are June 1, July 1, July 7, July 8, August 21; those for the females, May 29, June 1, June 2, June 4, June 17, June 19, July 1, July 2, July 26, August 21. Two pairs in copulation were collected on July 1 and August 21, respectively. The undermaculated specimens of *ulkei* from Oregon—six males and two females—were caught by Professor H. A. Scullen at Three Sisters, the males between August 8–15, the females, August 13–15. Professor Timberlake's records indicate that *Gutierrezia sarothræ* was the plant most favored by both sexes. Females were taken also at *Stephanomeria virgata* and *Senecio douglasii*. One of the copulating pairs was caught on *Heterotheca grandiflora*. Both of Professor Scullen's females, on the other hand, and one of his males were taken on a species of *Aster*.

Of the specimens of *ulkei* that constitute a more or less distinct variety under the name of *davidseni* six males were taken in 1927 between July 15 and 17 at Big Pines Camp, California, and eleven females at the same locality between July 13 and 17. Two additional females were collected at Mt. San Antonio, California, August 22, 1920—the one at 4,800, the other at 5,000 feet—and a third was taken in the San Jacinto Mountains, California, on July 14, 1912. Professor Timberlake's floral records for this *davidseni* group are as follows: On *Erigeron stenophyllus* all of the seventeen specimens from Big Pines Camp; on *Eriogonum fasciculatum* and the flower of an *Aster* species the two specimens taken on Mt. San Antonio.

Of *parvum* var. *swenki* there are sixteen males and seven females in the collection of Professor Timberlake. Of these three—all males—were taken at Big Pines Camp, California, July 13–17, 1927, on *Erigeron stenophyllus*. All of the remaining specimens were collected at Riverside, California, the males on *Gutierrezia sarothræ*, the females with two exceptions also at this plant. The two exceptional cases are recorded from *Heterotheca grandiflora*. The dates for the Riverside males are: May 25,

May 29, June 1, June 4, June 8, June 18, July 8, September 9, September 11, September 22. For the females the dates are May 29, July 2, July 9, July 10, August 4, September 9, September 26.

There are four females assignable to *consimile*, or preferably *pudicum* var. *consimile*, and there are ten males of *pudicum provancheri*, which is here associated with *consimile* as its male. Two of the females were caught on *Gutierrezia sarothræ* (May 27, 1925 and September 23, 1925), the third on *Trichostema lanceolatum* (August 11, 1924), and the fourth on *Lotus americanus* (August 12, 1926). Six of the males were taken on *Gutierrezia sarothræ*, May 27 (two specimens), May 29, June 1, July 9, September 14—all dates in the year 1925. Two of the males were taken on April 27 and September 22, 1926, while visiting *Lotus scoparius*. Yet another male was collected July 22, 1927, on *Eremocarpus setigerus*. All of the males thus far mentioned like the associated females were caught by Professor Timberlake at Riverside. A single male from Mt. Lowe, California, was obtained from a "cemented gravel nest." In this male the lateral lobes of the pygidium are relatively wider than in the other specimens.

Dianthidium concinnum (Cresson)

New Record from Colorado

A female specimen bred from one of several cells that Cornell University obtained from Mr. G. H. Gilbert on October 11, 1895, is assignable to *D. concinnum*. I have compared it with Cresson's type. The nest material was obtained from the "underside of a stone in eastern Colorado, 10 miles south of Laramie, altitude about 4,200." This is, I believe, the first published record of the occurrence of *concinnum* in that state; all but one of the other records—and that doubtfully reported—have been from Texas. The following information regarding the specimen and the cells associated with it has been supplied through the kindness of Professor Bradley from data in the files of Cornell University. It is not indicated by whom the record was kept:

"14 Apr. '96. The cocoons have been kept in a tumbler in my desk all winter. I have kept them moist as possible. Opened one to-day and found a recently formed pupa.

"5th May '96. One cocoon found open and *bee*(?) was emerging. Pinned it. The pupa of 14th April not yet become adult; it may be dead.

"1st June '96. The bee emerged from cell in which pupa was found 14th April '96. Pinned the bee. Occupants of the cells rotted. Pinned the piece containing the cells as there are no more to emerge."

Paranthidium texanum (Cresson)

From Kansas

Two females of this species, taken at Blue Rapids, Kansas, and kindly loaned by Professor O. A. Stevens, constitute what I believe is a new record, the bee having been previously reported from localities in Texas.

Heteranthidium occidentale (Cresson) extends into Mexico

In the collection of the Paris Museum are two unidentified specimens—a male and female—from État de Puebla (environs de Tehuacan), Mexico, collected by L. Diguët, 1903, that belong to this species and extend its range into Mexico.

***Heteranthidium timberlakei*, new species.**

Male.—12 mm. Black with yellow maculations. The head somewhat wider than long, about the width of the mesonotum. The inner orbits of the eyes parallel. The clypeus mildly convex, about twice as long measured at the apex as it is wide and with a rather straight apical contour armed along the middle by about five subequal serrations or teeth, much as in *H. occidentale* and *H. zebratum* males. The supraclypeal area with large, shiny punctures in contrast to the smaller, denser, somewhat striate character of the punctation (partly concealed under heavy gray pile) in the region between the antennæ. The region between the lateral ocelli and the eye with somewhat smaller and slightly denser punctation than the region above the ocelli. The spaces between the punctures substriate and shiny.

The thorax above covered with small but exceedingly dense punctation, appearing granular and opaque in contrast with the tegulæ, which, while covered with a fine and even dense punctation, present nevertheless a shiny appearance. The punctation of the tegulæ presents a condition somewhat intermediate between the dense, rather opaque punctation on these parts in *H. occidentale* and even in *H. zebratum* on the one hand and the semi-punctate condition in *H. bequaerti* and *H. larrea* on the other. The pro-

podeum with rather coarse, somewhat cancellate punctation along the base of the triangular enclosure (briefly interrupted at the middle) but with the apical region of the enclosure impunctate and with the punctation outside of the enclosure of somewhat the same character but sparser than that at the base.

The abdominal punctation dense and rather blurred on tergites 1 and 6. Tergites 2-5 with relatively sparser punctation from tergite to tergite. In each of these tergites, too, the punctation is notably sparse at the base—much sparser than in the apical region of the tergite preceding it. The punctures have a tendency to group themselves in irregular chains, those of a particular chain often being in direct contact with one another but separated in turn from another chain by sometimes one or more times the diameter of a puncture. The basal middle of the tergites relatively impunctate, that of tergites 4 and 5 polished and shiny. The narrow depressed area just beyond the maculated portions of each tergite roughened with cancellate punctation that gives way abruptly to a smooth, slightly reflexed apical rim. Segment 6, viewed in profile, has a rather straight, not convex contour. The pygidium is gently convergent to subtruncate along its apex except for a median tooth-like projection. A longitudinal carina, that proves to be rather concave when the segment is viewed in profile, traverses the tergite, ending in the above-mentioned tooth. The venter is deeply concave, almost pit-like, as the apex is approached—a structural peculiarity shared in varying degrees by several of the males of the genus *Heteranthidium* and even by some of the males of *Paranthidium*. The depression is most profound along the middle of the penultimate sternite, although a low carina-like to subtuberculate prominence near the apex of this sternite protrudes from the shiny depth. On each side of the middle of the sternite that precedes the penultimate is a comb-like fringe of stiff black recumbent hairs, as different in character as they are in color from the rather plumose grayish-white pubescence on the rest of the venter. In the type and one of the paratypes the hair inclines to golden on the vertex, thorax above, on the apex of the abdominal maculations, and strongly so on the under side of the basitarsi; the rest of the hairs are grayish-white to ochraceous. In the other two paratypes the pile is more uniformly grayish-white, except for the inside of the basitarsi.

The wings are subhyaline to light brownish, the upper half of the marginal cell traversed by a darkish streak. In the males and in one of the females the second recurrent vein, instead of conforming to the standard venation of *Heteranthidium* by being interstitial with the second transverse cubital, shows a condition somewhat intermediate between the venation of *Heteranthidium* and *Dianthidium*. In all other respects, however, these insects ally themselves with *Heteranthidium* and it is there, in my estimation, that they undoubtedly belong. A similar departure from the normal has been noted by Professor Cockerell in the venation of specimens of *Anthidium pcosense* from Flagstaff.

The yellow maculations in the male are as follows: Mandibles except black teeth and a fine line of black along the outer side (seen only when the insect is held with the full face showing), entire clypeus except apical margin (which is black in type, but brownish hyaline in paratypes), lateral face marks (which are broadly triangular to a little above the antennæ and then continue line-like along the inner margin of the eye to the level of the anterior ocellus), a narrow supraclypeal band (absent in one of the paratypes), stripes on the scape in front (only faintly indicated in one of the paratypes and absent in another), a stripe extending downward behind each of the eyes but usually with a very broad interruption at its middle. A small maculation near the middle of the outer rim of the tegulæ and in the case of two of the paratypes a spot of yellow on the rather blunt tubercles. Thorax otherwise usually devoid of maculations in the male but in one of the three paratypes before me there is a line on each side of the mesonotum above the tegulæ and a small spot on the axilla. The hind coxæ broadly yellow beneath (not so in one of the paratypes), the hind trochanters with a spot near the apex. All of the femora striped beneath; conspicuous knee spots on the middle and hind legs. The front and middle tibiæ externally with large yellow areas at the base and apex that are connected by a thin stripe of yellow on the anterior margin of the joint and by another stripe running lengthwise down the middle of its external face, two elongate black marks in a field of yellow being the resulting condition on each of these tibiæ (in one of the paratypes the connecting stripes fail to extend the full length of the tibiæ). The hind tibiæ have a large oval black mark imbedded in the middle of a field of yellow, supplemented by a much smaller black mark at the apex. The rather straight third tibial spines that taper to a point and are finely pectinate along their inner margin, are reddish yellow and transparent. All of the basitarsi are externally wholly yellow except at the extreme apex. The abdominal bands very similar to those of *zebratum*, the bands on tergites 1-4 extending in a sweeping curve from one lateral extremity to the other and tapering toward the middle. The bands on these segments are progressively broader, that on tergite 1 being so attenuated that in the type and one of the paratypes a slight median interruption has resulted. In the type and paratype in question, too, this band has slight lateral emarginations above, recalling a condition more usual in *H. occidentale*. Tergites 4 and 5 are wholly yellow except for the black apical rims and a rather large black V-shaped area at the base, which in the case of tergite 4, at least, gives to the maculations a rather rounded outline above. Tergite 7 of the type, yellow except for two imbedded black spots, the median tooth, and a narrow apical rim of black (this is the condition also in one of the paratypes while the other two have the yellow reduced to absent). Sternites 2 and 3 of two of the paratypes with a yellow spot at each lateral extremity; in the type these sternites are immaculate.

Female.—Size 13 mm. The apex of the clypeus of somewhat more rounded outline than in the male, serrated rather evenly along most of its

length. The eyes virtually parallel. The abdominal punctation more uniform, rather finer and denser than in the male, with the median basal region less impunctate and less shiny; but this may be an individual rather than a sexual difference. The venter of the usual female type.

The pile grayish white to ochraceous, the yellow tinge being more or less prevalent and easily noticeable without the aid of the microscope on the ventral scopa. The last sternite, however, has shorter hairs of a deep gold to copper hue, much like the color of the hair on the basitarsi.

The maculations in some ways rather unexpectedly different from those of the male. The prolongation of the marks on the sides of the face are not merely line-like but relatively broad and slightly inbent along their inner contour. The yellow on the mandibles is more restricted. The supraclypeal band, usual in the male, has in the female shrunk to a median spot. The bands behind the eyes, usually interrupted in the male, are in the female continuous to the summit of the eye, but the entire vertex is in both sexes immaculate. In sharp contrast to the immaculate condition of the mesonotum, axillæ, and scutellum, usual in the male, the female has all of these parts maculated, the mesonotum bearing large L-shaped maculations at its antero-lateral angles and the axillæ and scutellum being conspicuously marked with a total of four large oval spots—of which the two on the axillæ are slightly smaller than the two on the scutellum. The mesopleura of the female with a large area of yellow in contrast to the immaculate pleura of the male. The tegulæ with a band rimming the outer anterior half; the tubercles with merely a spot of yellow. The hind coxæ are strongly maculated. There are well developed stripes on the front and middle femora beneath and a vestigial stripe near the apex of the hind femora; the middle and hind knees are maculated. The tibiæ are externally yellow except for their apices and a more or less narrow black streak posteriorly on the front and middle pair and anteriorly on the hind pair. The basitarsi and tibial spines colored as in the male. Similar to those of the male are also the bands on the tergites, except that the band on tergite 1 is in the specimens before me neither emarginate laterally above nor interrupted and that tergite 6 is wholly yellow except for a black spot-like intrusion on each side at the apex.

From *zebratum* the male of *timberlakei* is most readily differentiated by the relatively straight as contrasted with convex contour of tergite 6 when viewed in profile, and by the more truncate character of the apex of the pygidium, that of *zebratum* being sharply angular, with the sides of the apex rather shoulder-like and prominent in contrast to the absence of such formations in *timberlakei*. If the absence of maculations on the scutellum be a constant character, this alone may serve to differentiate *timberlakei* males from those of *zebratum*. Only one of the four males

of *timberlakei* before me has even a vestige of maculation on the axillæ and none of them is maculated on the scutellum. In *zebratum* males the scutellum and usually also the axillæ are maculated. The absence of maculations on the mesonotum, observed in three out of four of the male specimens, is, on the other hand, an easy way of differentiating *timberlakei* males from those of *occidentale*. Structurally, the male of *timberlakei* can be separated at once from *occidentale* through the presence of the strongly protruding median tooth on the pygidium, the pygidium of *occidentale* being in contrast slightly bilobed to subtruncate at its apical middle. It is not likely that the male of *timberlakei* will be confused with any species other than *zebratum* or *occidentale* unless it be with the still undiscovered male of the insect presently to be described (*H. subtimberlakei*). Comparison of the genitalia of *timberlakei*, as figured in the accompanying cut, with those published by Miss Ruth Isensee (Annals of Carnegie Mus., Vol. XVII, Nos. 3-4, 1927) for *H. occidentale* and *H. zebratum* will bring out other points of difference.

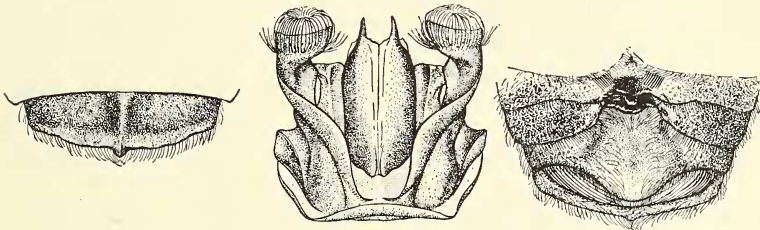


FIG. 1. Pygidium, genitalia, and view of apical ventral segments of *Heteranthidium timberlakei*, new species.

The female may be differentiated from the corresponding sex of *zebratum* and *occidentale* by the presence of the large maculation on the mesopleura, by the fuller maculation of the legs and by the contrast offered between the color of the pile on the last sternite and that of the sternites preceding, the coloration of the ventral scopa in *zebratum* and *occidentale* being uniform throughout.

The six specimens—four males and two females—on which the above descriptions are based were taken by Professor Timberlake

at Riverside, California, April 28–May 5, 1928. The two female specimens and one of the males were taken on *Chaenactis glabriuscula*, the remaining three males on *Encelia farinosa*.

The present species is named in honor of Professor P. H. Timberlake, to whom I am indebted not only for the opportunity of examining his fine collection of California Anthidiinæ—many of them already identified by him—but also for suggestions and interpretations that invariably have been of great helpfulness.

Heteranthidium subtimberlakei, new species.

Very close in certain respects to *H. timberlakei* is what I am designating as *subtimberlakei*, based on a single female specimen taken in Nevada County, California. Superficially it is much like the females of *timberlakei* just described. The facial maculations are the same except that the supra-clypeal spot is wanting in *subtimberlakei*. The maculations behind the eyes are the same except that, instead of terminating at the summit of the eye, they are continued rather broadly in *subtimberlakei* to the outer ocelli. In both species there are the rich ornamentations on the mesopleuræ, the L-shaped bands bordering the mesonotum, the maculations on tubercles and tegulae. In *subtimberlakei*, however, there are no maculations on the scutellum, only on the axillæ—a condition shared, nevertheless, by one of the males of *timberlakei*. The maculations of the tibiæ are of similar character to those of *timberlakei*, but the stripes on the under side of the femora are lacking and only on the hind basitarsi is there a stripe, the fore and middle basitarsi being immaculate. The abdominal bands are of the same type as those of *zebratum*, uninterrupted, extending from extremity to extremity of the tergite in a sweeping curve that is gradually attenuated toward the middle. As in *zebratum* and *timberlakei* the apical tergites of *subtimberlakei* have increasingly broad bands, but segment 6 of *subtimberlakei* departs from the female allotype and the single female paratype of *timberlakei* in having merely two spots instead of the almost completely yellow tergite 6 mentioned for *timberlakei*.

While these differences in the maculations of the two species are not very striking and may possibly be bridged by intermediates when series from other localities become available, they are supplemented by one or two important structural differences which are less easily reconciled. Especially to be noted in *subtimberlakei* is the unusual upward convergence, even though slight, of the eyes and the relative narrowness of the eyes as contrasted with the width of the cheeks.

I have compared the present specimen with females of *H. occidentale*, *H. zebratum*, *H. fontemvite*, *H. bequaerti*, *H. dorsale* (*harbecki*), *H. ridingsii*, *H. crassipes*, *H. larreae*, and *H. timberlakei*, selecting the types of these species where available. None of these have the eyes unmistakably con-

vergent above, as indicated for *subtimberlakei*. In *H. ridingsii* and *H. crassipes* of our Southeast the eyes are distinctly convergent below. In the other two species of the Southeastern United States, *H. dorsale* (*harbecki*) and *H. fontemvitæ*, there is a slight downward convergence. In *H. bequaerti*, *H. occidentale*, *H. zebratum*, and *H. timberlakei*—all Western—the inner margins of the eyes are virtually parallel to each other, while in another Western species *larrea*, they converge below.

H. subtimberlakei has a V-shaped, almost impunctate depression in the supra-clypeal area, but as in *H. timberlakei* a slight depression in this area may also be noted, the difference is mainly one of degree. The punctation on the tegulae and on the abdomen is a shade finer in *subtimberlakei* than in the females of *timmerlakei*, with a closer approach to an immaculate condition in the basal region of tergites 3, 4 and 5.

The pile of *subtimberlakei* is yellowish white to light golden on the face, vertex, thorax above, venter and dorsum of abdomen, and legs; the hairs on the inner surface of tarsi and the short hairs on apical sternite (at least in some lights) are more deeply golden.

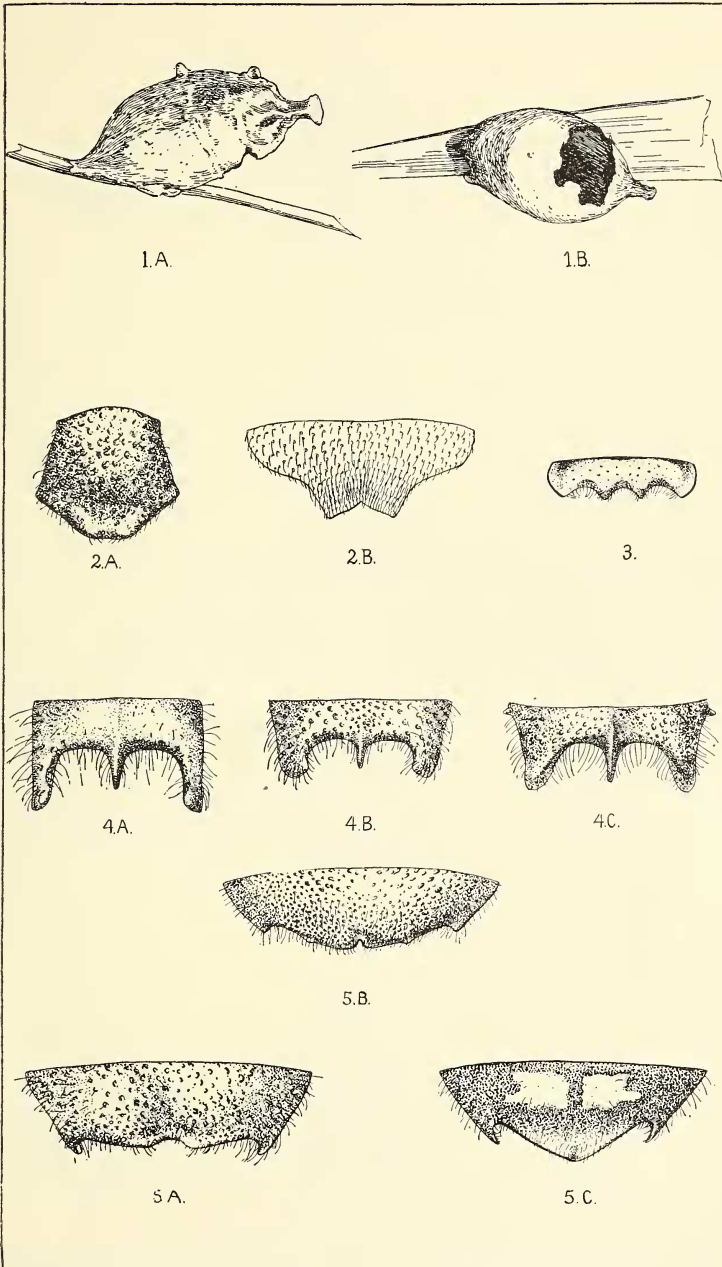
PLATE XII

Cells of *A. notatum rufimaculatum*: 1A, cell of ♂; 1B, cell of ♀.

Clypeus (2A) and pygidium (2B) of *A. ehrhorni* ♀. 3. pygidium of *A. ehrhorni* ♂.

Pygidium of ♂ of *maculosum* (4A), *maculifrons* (4B), *banningense* (4C).

Pygidium of ♀ of *maculosum* (5A), *maculifrons* (5B), *banningense* (5C).



ANTHIDIINÆ

PLATE XIII

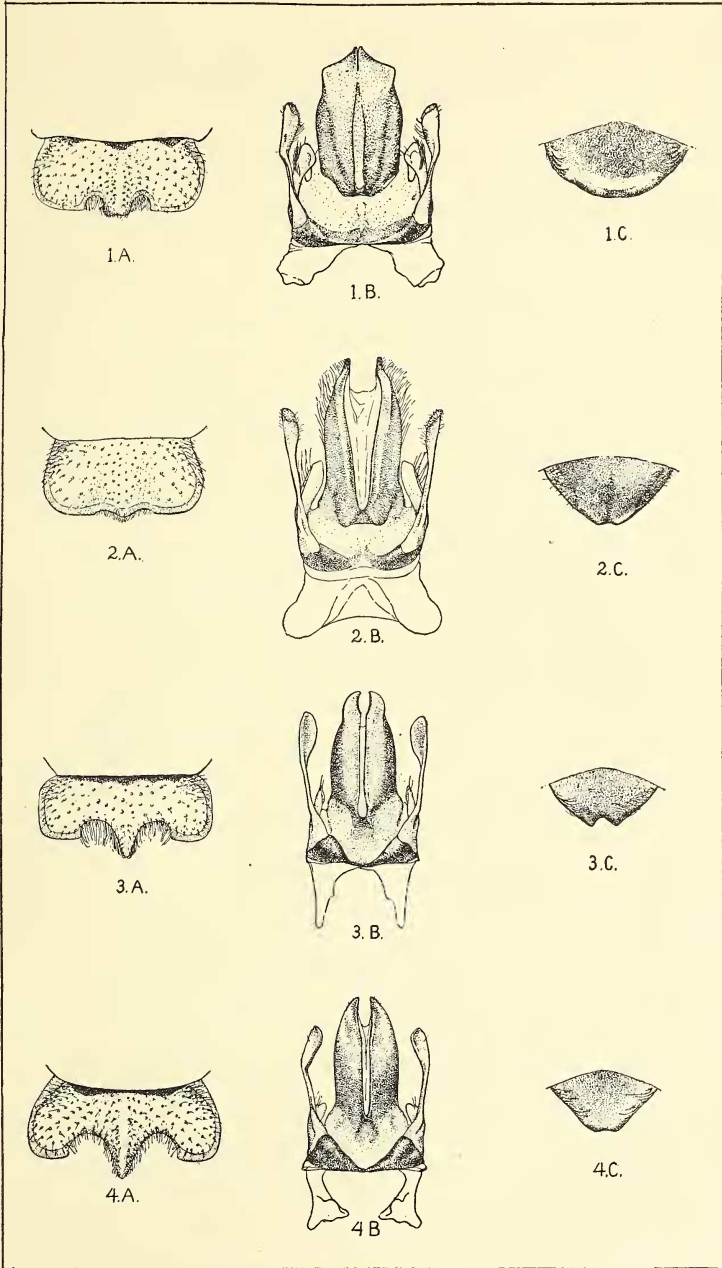
Pygidium (left), genitalia (middle) and apical sternite (right) of ♂ of:

Dianthidium parvum var. *swenki*, new variety (1 A.B.C.).

Dianthidium ulkei var. *riparii*, new variety (2 A.B.C.).

Dianthidium pudicum var. *consimile* (Ashmead) (3 A.B.C.).

Dianthidium dubium, new species (4 A.B.C.).



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